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High-energy Coherent THz radiation From Laser Wakefield Accelerated Ultrashort Electron Bunches J. VAN TILBORG, LBNL, C.G.R. GEDDES, LBNL, C. TOTH, LBNL, E.H. ESAREY, LBNL, C.B. SCHROEDER, LBNL, W.P. LEEMANS, LBNL

We report on the observation of coherent THz radiation from femtosecond laser-accelerated electron bunches [1]. These multi-nC bunches, concentrated in a length of a few plasma periods (several tens of microns) will experience a strongly reduced space charge force due to shielding by the background ions. The radiation, scaling quadratically with bunch charge, is a combination of diffraction and transition radiation by the electrons passing the plasma-vacuum boundary. If both a large collection angle as well as a large transverse plasma size are realized, theory predicts energies on the order of 0.1 mJ per THz pulse for current electron beam properties. A first improvement of the collection angle has increased the detected energy from 5 nJ to 80 nJ. Recent results on the characterization of this source (such as the spectrum) will be discussed and electron beam properties at the boundary will be addressed. (This work is performed under DOE-contract DE-AC-03-76SF0098) [1] W. P. Leemans et al., Phys. Rev. Lett., in press (2003)

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